DETECTION OF DDOS ATTACK USING MACHINE LEARNING ALGORITHM

A Mini Project Report

submitted by

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to

the APJ Abdul Kalam Technological University
in partial fulfillment of the requirements for the award of the Degree

of

Master of Computer Applications

Department of Computer Applications

MES College of Engineering
Kuttippuram, Malappuram - 679 582

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DECLARATION

I undersigned hereby declare that the project report **DETECTION OF DDoS ATTACK USING MACHINE LEARNING ALGORITHM**, submitted for partial fulfillment of the requirements for the award of degree of Master of Computer Applications of the APJ Abdul Kalam Technological University, Kerala, is a bonafide work done by me under supervision of Dr. GEEVAR C ZACHARIAS, Assistant Professor, Department of Computer Applications. This submission represents my ideas in my own words and where ideas or words of others have been included, I have adequately and accurately cited and referenced the original sources. I also declare that I have adhered to ethics of academic honesty and integrity and have not misrepresented or fabricated any data or idea or fact or source in my submission. I understand that any violation of the above will be a cause for disciplinary action by the institute and/or the University and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been obtained. This report has not been previously formed the basis for the award of any degree, diploma or similar title of any other University.

Place:

....

Date:

DEPARTMENT OF COMPUTER APPLICATIONS
MES COLLEGE OF ENGINEERING, KUTTIPPURAM

CERTIFICATE

This is to certify that the report entitled **DETECTION OF DDoS ATTACK USING MACHINE LEARNING ALGORITHM** is a bonafide record of the Mini Project work carried out by **FATHIMATH SUHARA M A (MES20MCA-2018)** submitted to the APJ Abdul Kalam Technological University, in partial fulfillment of the requirements for the award of the Master of Computer Applications, under my guidance and supervision. This report in any form has not been submitted to any other University or Institution for any purpose.

Internal Supervisor(s) External Supervisor(s)

Head Of The Department

Acknowledgements

At the very outset I would like to thank the almighty's mercy towards me over the years. . . I wish to express my sincere thanks to my project guide Ms.Priya J.D Assistant Professor, Dept. of Master of Computer Applications who guided me for the successful completeness of this project. I also thank her for valuable suggestions, guidance, constant encouragement, boundless corporation, constructive comments and motivation extended to me for completion of this project work.I would express my sincere thanks to my internal guide Dr.Geevar C Zacharias, Assistant Professor,Dept. of Master of Computer Applications, for their immense guidance to complete the project successfully.I would like to express my sincere thanks to all the faculty members of Master of Computer Applications department for their support and valuable suggestion for doing the project work.Last but not least my graceful thanks to my parents, friends and also the persons who supported me directly and indirectly during the project.

FATHIMATH SUHARA M A (MES20MCA-2018)

Abstract

With the increase in usage of networking technology and the Internet, Intrusion detection becomes important and challenging security problem. A number of techniques came into existence to detect the intrusions on the basis of Machine Learning and Deep Learning procedures. This paper will give inspiration to the use of Machine Learning techniques to IP traffic and gives a concise depiction of every one of the Machine Learning strategies. This paper proposes a DDoS attack detection method based on Machine Learning. Machine Learning methods are compared with regard to their accuracy and detection potential to detect different types of intrusions.The experimental results show that the proposed DDoS attack detection method based on machine learning has a good detection rate for the current popular DDoS attack. Future Research includes Machine Learning methods to find the intrusions so as to improve the detection rate, accuracy and to minimize the false positive rate.

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Introduction

1.1 Background

I. Distributed denial-of-service attack, also known as DDoS attack, is one of the most common network attacks at present. With the rapid development of computer and communication technology, the harm of DDoS attack is becoming more and more serious.Therefore, the research on DDoS attack detection becomes more important.

II. This type of attack takes advantage of the specific capacity limits that apply to any network resources – such as the infrastructure that enables a company's website. The DDoS attack will send multiple requests to the attacked web resource – with the aim of exceeding the website's capacity to handle multiple requests… and prevent the website from functioning correctly.

III. In view of this, this paper proposes a DDoS attack detection method based on machine learning, which includes two steps: feature extraction and model detection.

The experimental results show that the proposed DDoS attack detection method based on machine learning has a good detection rate for the current popular DDoS attack.

1.1.1 Motivation

Network resources – such as web servers – have a finite limit to the number of requests that they can service simultaneously. In addition to the capacity limit of the server, the channel that connects the server to the Internet will also have a finite bandwidth / capacity. Whenever the number of requests exceeds the capacity limits of any component of the infrastructure, the level of service is likely to suffer in one of the following ways:

* The response to requests will be much slower than normal.

* Some – or all – users' requests may be totally ignored.

Usually, the attacker's ultimate aim is the total prevention of the web resource's normal functioning – a total 'denial of service'. The attacker may also request payment for stopping the attack. In some cases, a DDoS attack may even be an attempt to discredit or damage a competitor's business.In this project,we use several machine learning algorithms to train a model which can be used to detect and classify the type of DDoS attack with greater accuracy.The effect of Denial of Services will be detected by using this machine learning algorithms and the defect can be controlled by taking necessary precautions.

1.2 Objective

The aim of the project is to detect the DDoS attacks by using different Machine Learning Algorithms that will be able to achieve the following objectives:

a.To analyze data and it's parameters to check any redundancy in data values that may affect prediction results.

b.To remove all the empty/uncertainty values.

c.To detect the DDoS attacks, extract the essential features.

d.Use different types of classifiers to compare the model accuracy of detecting the DDoS attacks.

e.To be able to generate output within a specified period of time.

1.3 Report Organization

The project report is divided into four sections. Section 2 describes literature survey. Section 3 describes the methodology used for implementing the project. Section 4 gives the results and discussions. Finally Section 5 gives the conclusion.

Chapter 2

Literature Survey

Sumaiya Thaseen Ikram et al. in [11] projected a model with multi class support vector machine (SVM) and chi-square feature selection. Over fitting constant and Radial Basis Function kernel parameter are used for optimization in parameter tuning. They have used NSL-KDD dataset for evaluating the model. They have achieved 980.13 as false alarm rate for the implemented model. Alex Shenfielda et al. in [23] proposed a new model suitable for use in deep packet inspection based intrusion detection systems using ANN architecture. The proposed ANN architecture achieved an accuracy of 98Tenfold cross validation. An online exploit and vulnerability repository exploitdb [103] was used to classify the attacks. Nabila Farnaaz and M. A. Jabbar in [24] employed an IDS approach with random forest classifier. Feature selection method used is symmetrical uncertainty of attributes. NSLKDD data set was used for evaluating the new approach.They have compared random forest modeling with j48 classier. Their results proved that MCC, accuracy and DR used for multiclass attacks classification are increased. They have achieved 0.99and 99.67[42] proposed a model using the four classifiers: Random Forest, Naive Bayes, OneR, J48. They have used MODBUS data collected from a gas pipeline for evaluation. Tenfold cross validation they have used. Algorithm J48 performed better than others with Area Under Curve of 0.995, Precisionof 0.992, Recall of 0.992. Mostafa darkaie, Reza Tavoli in [56] employed a novel approach using multi-layer perceptron (MLP) neural network. Back propagation algorithm is used to train the neural network and minimize the error associated with weights. In this model, they have used KDD99 dataset for training and evaluation. In this model, for feature reduction, PCA algorithm is used. The new method has achieved 91anomaly based IDS using Long Short Term Memory (LSTM). CIDDS dataset is used for evaluating the model. They have achieved an accuracy of 85.5framework of NIDS and HIDS that can be used to detect and to alert possible cyber attacks. The benchmark datasets used are : CICIDS 2017, NSLKDD, Kyoto, UNSW-NB15, WSN-DS and also KDD CUP99.

Chapter 3

Methodology

3.1 Introduction

Distributed denial-of-service attack, also known as DDoS attack, is one of the most common network attacks at present. With the rapid development of computer and communication technology, the harm of DDoS attack is becoming more and more serious.Therefore, the research on DDoS attack detection becomes more important. This type of attack takes advantage of the specific capacity limits that apply to any network resources – such as the infrastructure that enables a company's website. The DDoS attack will send multiple requests to the attacked web resource – with the aim of exceeding the website's capacity to handle multiple requests... and prevent the website from functioning correctly. In view of this, this paper proposes a DDoS attack detection method based on machine learning, which includes two steps: feature extraction and model detection. The experimental results show that the proposed DDoS attack detection method based on machine learning has a good detection rate for the current popular DDoS attack.

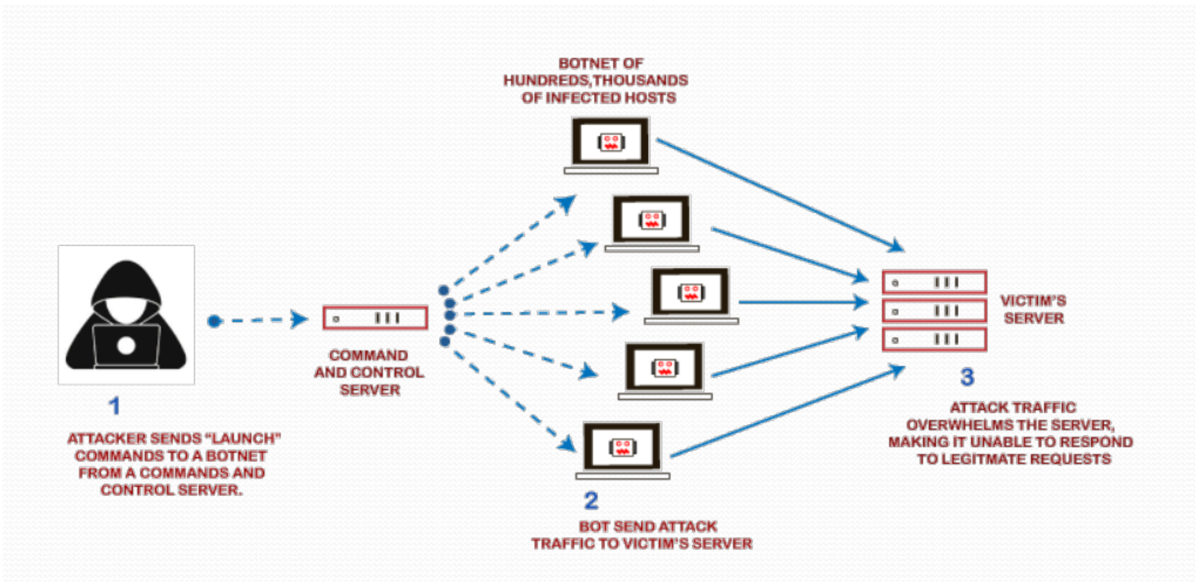

BOTNET OF HUNDREDS,THOUSANDS OF INFECTED HOSTS
COMMAND AND CONTROL SERVER
VICTIM'S SERVER
1
ATTACKER SENDS "LAUNCH" COMMANDS TO A BOTNET FROM A COMMANDS AND CONTROL SERVER.
2
BOT SEND ATTACK TRAFFIC TO VICTIM'S SERVER
3
ATTACK TRAFFIC OVERWHELMS THE SERVER, MAKING IT UNABLE TO RESPOND TO LEGITMATE REQUESTS

Figure 3.1: DDos Attack Diagram

Our objective is to find the best Machine Learning Algorithms for the detection of ddos attack. Then the best performing model will be saved and will be linked to a user interface by which it can predict new input data . To achieve this objective training data have to go through various intermediate processes before giving it to Algorithms. The main parameters on which the performance of the model will be judge are accuracy of the mode1.

1.Data Collection

Data is the prime ingredient of this project, as these data features are various machine learning algorithms. By using these features of the data, Machine Learning Algorithms are trained and models are created. In this proposal, we have taken a ddos attack dataset with 3,11,029 data points and 49 features from Kaggle Website . This data set is divided in the ratio of 70:30 for training and testing of algorithms.

2 .Data Cleaning

Data set is a chunk of data that is in raw form. It may contain certain symbols like digits, special characters, blank lines, and data without any label. These symbols should be removed as it is of no importance and it can also affect the performance of the model in an adverse manner.

3. Data Preprocessing

After data cleaning, data is now free of unwanted symbols. This data should be converted into the form which can be used for extracting the features easily. It eliminates the null values.

4. Feature Selection

Feature Selection is the process where we select those features which contribute most to your prediction variable or output. Certain features are present in ddos attack, we have to extract them and accordingly, our classier is trained to predict the ddos attack. For analysis and classification problems we have used eight features.

3.2 Developing Environment

Hardware Specification :

* Processor : Intel Pentium Core i3 and above
* Primary Memory : 4 GB RAM and above
* Storage : 500 GB hard disk and above
* Display : VGA Color Monitor
* Key Board : Windows compatible
* Mouse : Windows compatible

Software Specification :

* Language : Python
* Front end : Python Django
* Back end : SQLite
* Operating system : windows 7 and above
* IDE : Jupyter Notebook(Anaconda)
* Classifier : KNN Algorithm, Logistic Regression Algorithm, Decision Tree Algorithm and MLP Classifier
* Dataset : DDoS Dataset from Kaggle Website

3.3 Classsifiers

In our model, we used four types of machine learning algorithms and for the implementation work, we use the Jupyter notebook platform with the assistance of Python programmable language. The classification models that we implemented using the above-mentioned dataset are Logistic Regression, KNN Algorithm, Decision Tree and MLP Classifier. This algorithms are good for various classifications and that they got their own properties and performance for supporting different datasets.

3.3.1 Models

1. Logistic Regression Algorithm

Logistic Regression is a Machine Learning algorithm which is used for the classification problems, it is a predictive analysis algorithm and based on the concept of probability.We can call a Logistic Regression a Linear Regression model but the Logistic Regression uses a more complex cost function, this cost function can be defined as the 'Sigmoid function' or also known as the 'logistic function' instead of a linear function.The hypothesis of logistic regression tends it to limit the cost function between 0 and 1. Therefore linear functions fail to represent it as it can have a value greater than 1 or less than 0 which is not possible as per the hypothesis of logistic regression.

$$h\theta(X) = \frac{1}{1 + e^{-(\beta_0 + \beta_1 X)}}$$

Figure 3.2: The Hypothesis of Logistic Regression

2. KNN Algorithm

K-Nearest Neighbour is one of the simplest Machine Learning algorithms based on Supervised Learning technique. K-NN algorithm assumes the similarity between the new case/data and available cases and put the new case into the category that is most similar to the available categories. K-NN algorithm stores all the available data and classifies a new data point based on the similarity. This means when new data appears then it can be easily classified into a well suite category by using K- NN algorithm. K-NN algorithm can be used for Regression as well as for Classification but mostly it is used for the Classification problems. It is also called a lazy learner algorithm because it does not learn from the training set immediately instead it stores the dataset and at the time of classification, it performs an action on the dataset. KNN algorithm at the training phase just stores the dataset and when it gets new data, then it classifies that data into a category that is much similar to the new data.

Why do we need a K-NN Algorithm?

Suppose there are two categories, i.e., Category A and Category B, and we have a new data point x1, so this data point will lie in which of these categories. To solve this type of problem, we need a K-NN algorithm. With the help of K-NN, we can easily identify the category or class of a particular dataset. Consider the below diagram:

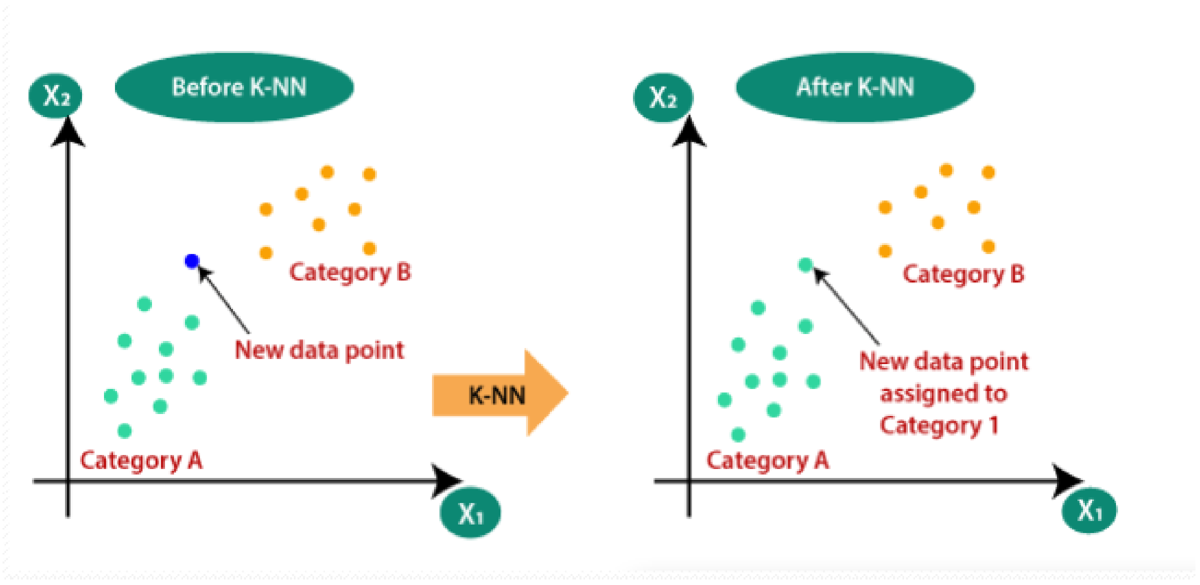


Figure 3.3: Diagram of KNN Algorithm

3. Decision Tree Classification Algorithm

Decision Tree is a Supervised learning technique that can be used for both classification and Regression problems, but mostly it is preferred for solving Classification problems. It is a tree-structured classifier, where internal nodes represent the features of a dataset, branches represent the decision rules and each leaf node represents the outcome.In a Decision tree, there are two nodes, which are the Decision Node and Leaf Node. Decision nodes are used to make any decision and have multiple branches, whereas Leaf nodes are the output of those decisions and do not contain any further branches.The decisions or the test are performed on the basis of features of the given dataset. .It is a graphical representation for getting all the possible solutions to a problem/decision based on given conditions.It is called a decision tree because,similar to a tree, it starts with the root node, which expands on further branches and constructs a tree-like structure. In order to build a tree, we use the CART algorithm, which stands for Classification and Regression Tree algorithm. A decision tree simply asks a question, and based on the answer (Yes/No), it further split the tree into subtrees. Below diagram explains the general structure of a decision tree:

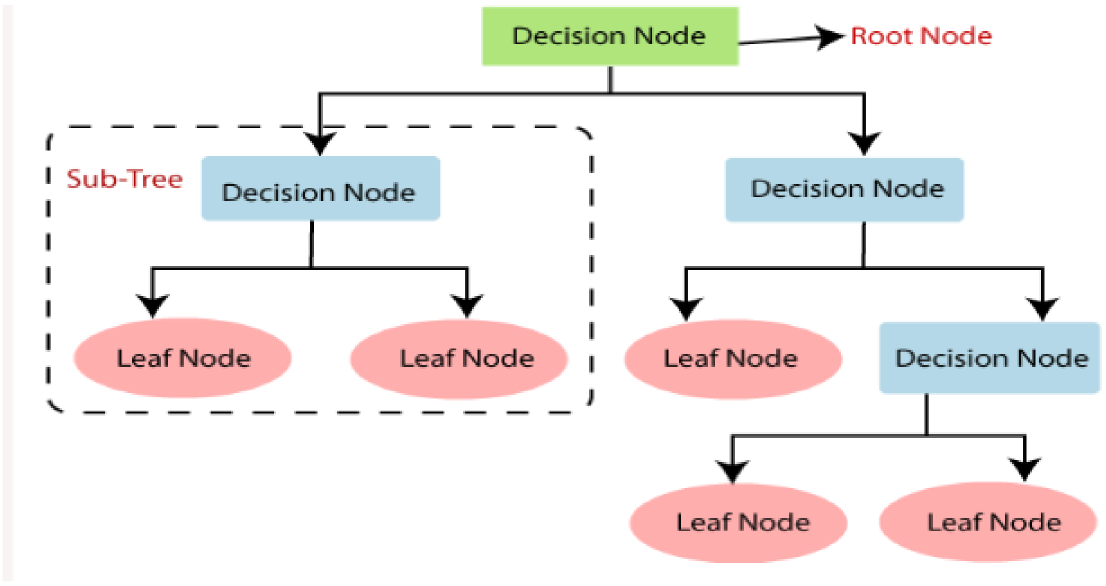


Figure 3.4: Diagram of Decision Tree

Why use Decision Trees?

There are various algorithms in Machine learning, so choosing the best algorithm for the given dataset and problem is the main point to remember while creating a machine learning model. Below are the two reasons for using the Decision tree:

* Decision Trees usually mimic human thinking ability while making a decision, so it is easy to understand.

* The logic behind the decision tree can be easily understood because it shows a tree-like structure.

4. MLP Classifier

The multilayer perceptron (MLP) is a feedforward artificial neural network model that maps input data sets to a set of appropriate outputs. An MLP consists of multiple layers and each layer is fully connected to the following one. The nodes of the layers are neurons with nonlinear activation functions, except for the nodes of the input layer. Between the input and the output layer there may be one or more nonlinear hidden layers.

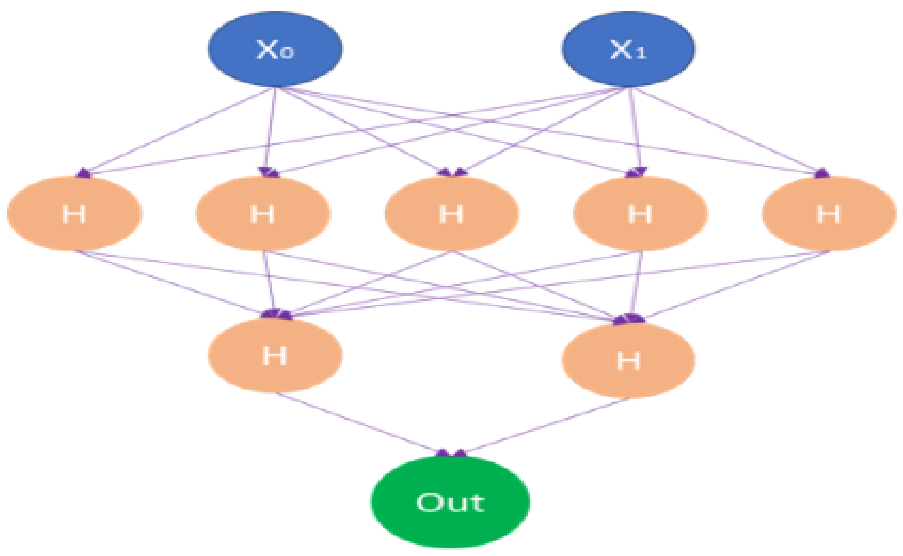
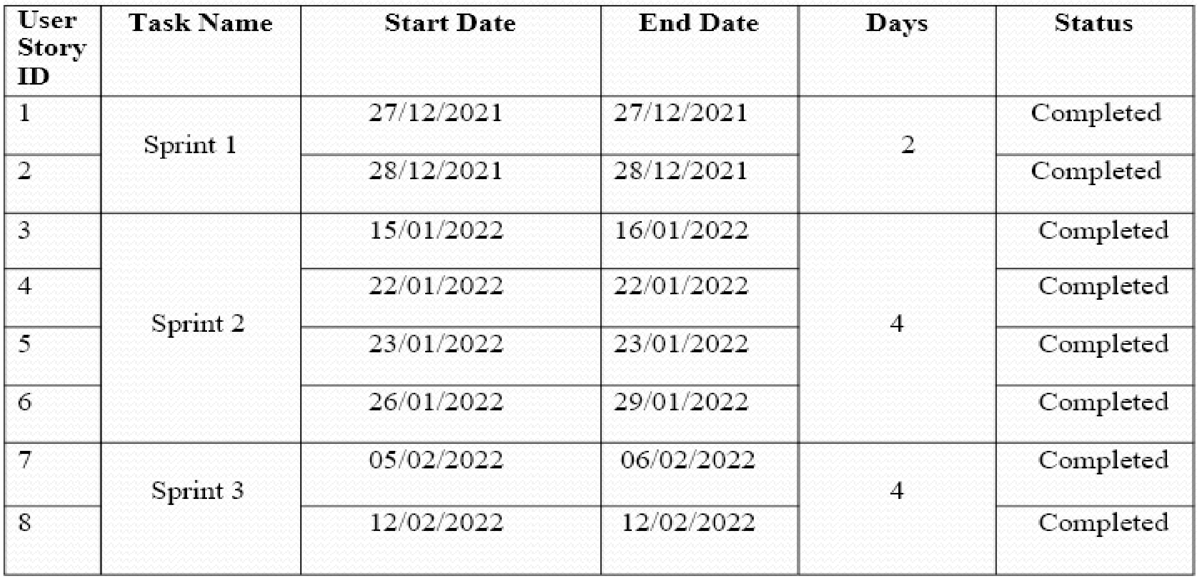


Figure 3.5: Diagram of MLP Classifier

3.3.2 Project Plan

A project plan that has a series of tasks laid out for the entire project, listing task duration, responsibility assignments, and dependencies. Plans are developed in this manner based on the assumption that the Project Manager, hopefully along with the team, can predict up front everything that will need to happen in the project, how long it will take, and who will be able to do it. Project plan is given below figure. The project has four sprints.

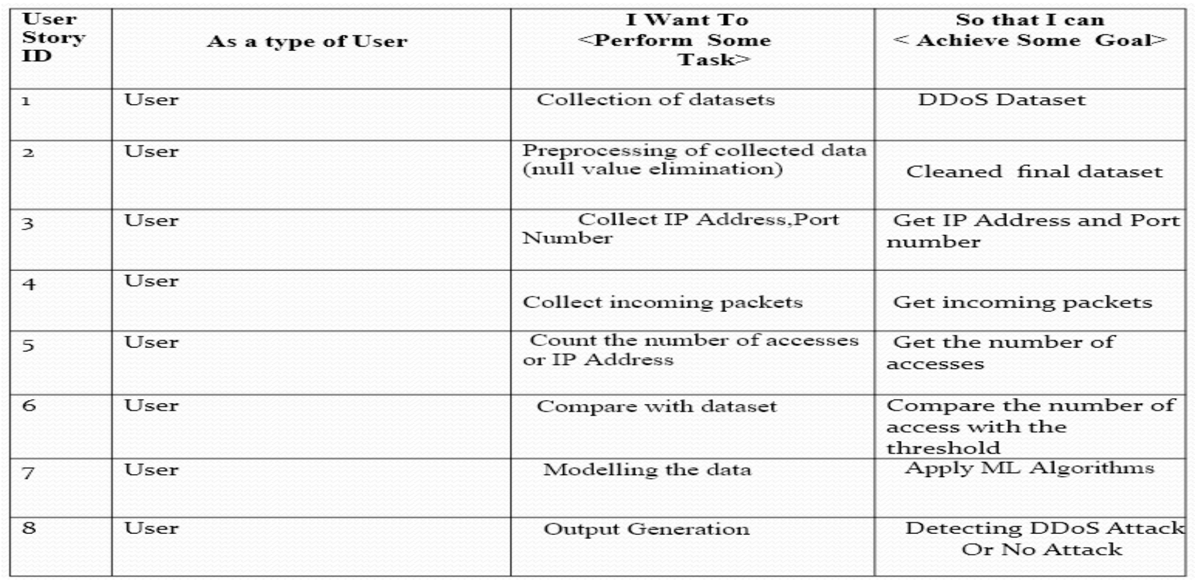


User Story ID	Task Name	Start Date	End Date	Days	Status
1	Sprint 1	27/12/2021	27/12/2021	2	Completed
2		28/12/2021	28/12/2021		Completed
3	Sprint 2	15/01/2022	16/01/2022	4	Completed
4		22/01/2022	22/01/2022		Completed
5		23/01/2022	23/01/2022		Completed
6		26/01/2022	29/01/2022		Completed
7	Sprint 3	05/02/2022	06/02/2022	4	Completed
8		12/02/2022	12/02/2022		Completed

Figure 3.6: Project Plan

3.3.3 User Story

A key component of agile software development is putting people first, and user-stories put actual end users at the center of the conversation. Stories use non-technical language to provide context for the development team and their efforts. After reading a user story, the team knows why they are building what they're building and what value it creates. A user story is a tool used in agile software development to capture a description of a software feature from an end user perspective. The user story describes the type of user, what they want and why. A user story helps to create a simplified description of a requirement. User stories are one of the core components of an agile program. They help provide a user-focused framework for daily work which drives collaboration, creativity, and a better product overall. The user story of system is given in the below figure.

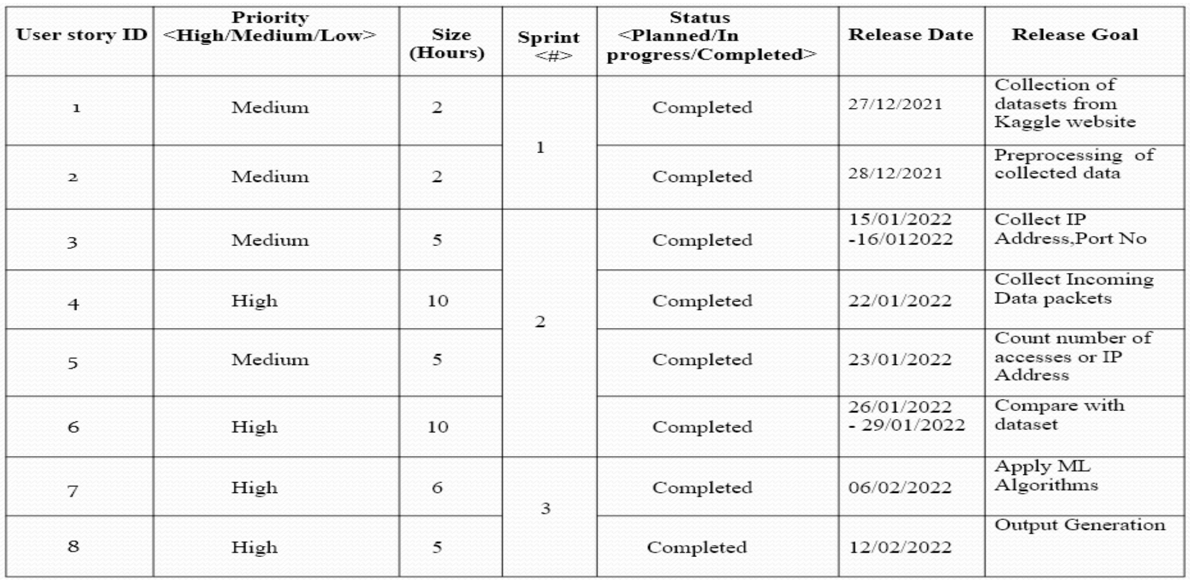


User Story ID	As a type of User	I Want To <Perform Some Task>	So that I can < Achieve Some Goal>
1	User	Collection of datasets	DDoS Dataset
2	User	Preprocessing of collected data (null value elimination)	Cleaned final dataset
3	User	Collect IP Address,Port Number	Get IP Address and Port number
4	User	Collect incoming packets	Get incoming packets
5	User	Count the number of accesses or IP Address	Get the number of accesses
6	User	Compare with dataset	Compare the number of access with the threshold
7	User	Modelling the data	Apply ML Algorithms
8	User	Output Generation	Detecting DDoS Attack Or No Attack

Figure 3.7: User Story

3.3.4 Product Backlog

A product backlog is a list of the new features, changes to existing features, bug fixes, infrastructure changes or other activities that a team may deliver in order to achieve a specific outcome.The product backlog is the single authoritative source for things that a team works on. That means that nothing gets done that is not on the product backlog. Conversely, the presence of a product backlog item on a product backlog does not guarantee that it will be delivered. It represents an option the team has for delivering a specific outcome rather than a commitment.It should be cheap and fast to add a product backlog item to the product backlog, and it should be equally as easy to remove a product backlog item that does not result in direct progress to achieving the desired outcome or enable progress toward the outcome. The Scrum Product Backlog is simply a list of all things that needs to be done within the project. It replaces the traditional requirements specification artifacts. These items can have a technical nature or can be user-centric e.g. in the form of user stories.The product backlog of the system is given below figure.

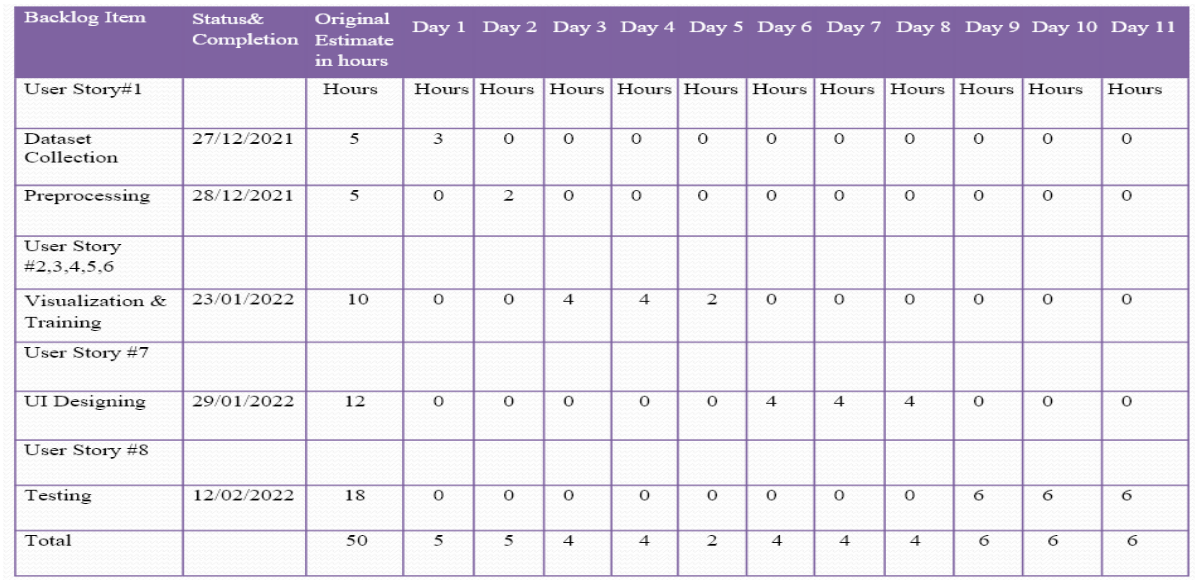


User story ID	Priority <High/Medium/Low>	Size (Hours)	Sprint <#>	Status <Planned/In progress/Completed>	Release Date	Release Goal
1	Medium	2	1	Completed	27/12/2021	Collection of datasets from Kaggle website
2	Medium	2		Completed	28/12/2021	Preprocessing of collected data
3	Medium	5	2	Completed	15/01/2022 -16/012022	Collect IP Address,Port No
4	High	10		Completed	22/01/2022	Collect Incoming Data packets
5	Medium	5		Completed	23/01/2022	Count number of accesses or IP Address
6	High	10		Completed	26/01/2022 - 29/01/2022	Compare with dataset
7	High	6	3	Completed	06/02/2022	Apply ML Algorithms
8	High	5		Completed	12/02/2022	Output Generation

Figure 3.8: Product Backlog

3.3.5 Sprint Backlog

The sprint backlog is a list of tasks identified by the Scrum team to be completed during the Scrum sprint. During the sprint planning meeting, the team selects some number of product backlog items, usually in the form of user stories, and identifies the tasks necessary to complete each user story. Most teams also estimate how many hours each task will take someone on the team to complete.

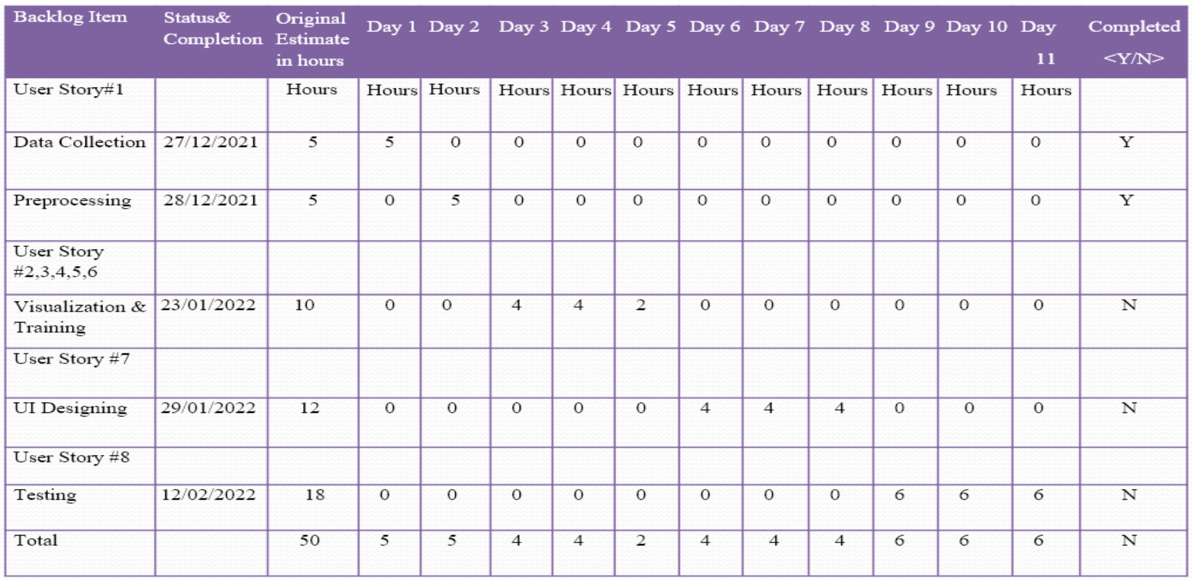


Backlog Item	Status& Completion	Original Estimate in hours	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10	Day 11
User Story#1		Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours
Dataset Collection	27/12/2021	5	3	0	0	0	0	0	0	0	0	0	0
Preprocessing	28/12/2021	5	0	2	0	0	0	0	0	0	0	0	0
User Story #2,3,4,5,6													
Visualization & Training	23/01/2022	10	0	0	4	4	2	0	0	0	0	0	0
User Story #7													
UI Designing	29/01/2022	12	0	0	0	0	0	4	4	4	0	0	0
User Story #8													
Testing	12/02/2022	18	0	0	0	0	0	0	0	0	6	6	6
Total		50	5	5	4	4	2	4	4	4	6	6	6

Figure 3.9: Sprint Backlog

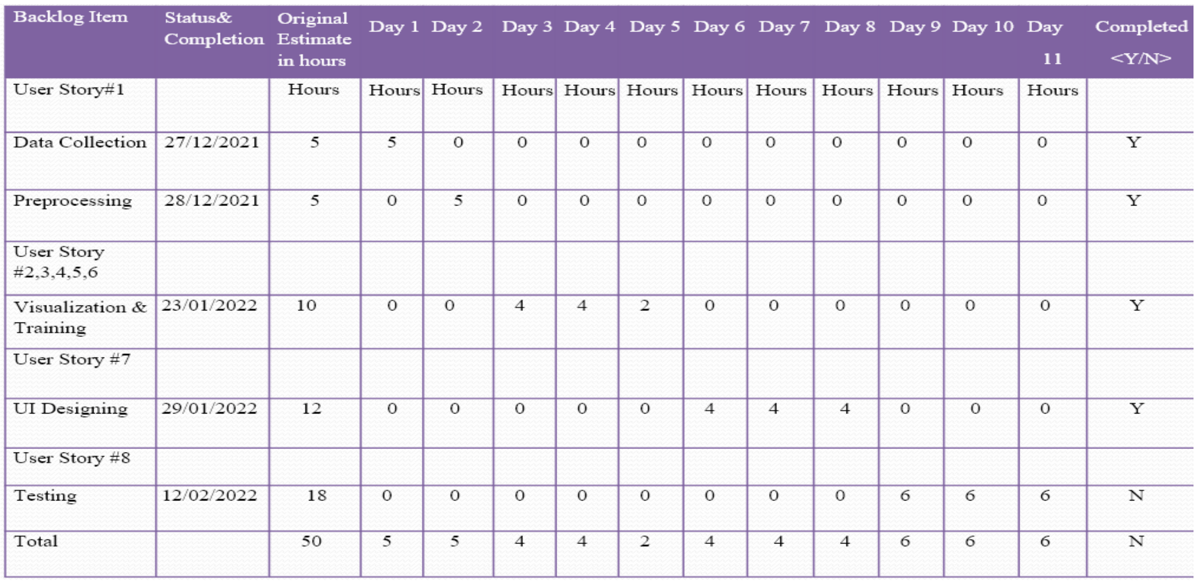
3.3.6 Sprint Actual

Actual sprint backlog is what adequate sprint planning is actually done by project team there may or may not be difference in planned sprint backlog. The detailed sprint backlog (Actual) is given below.



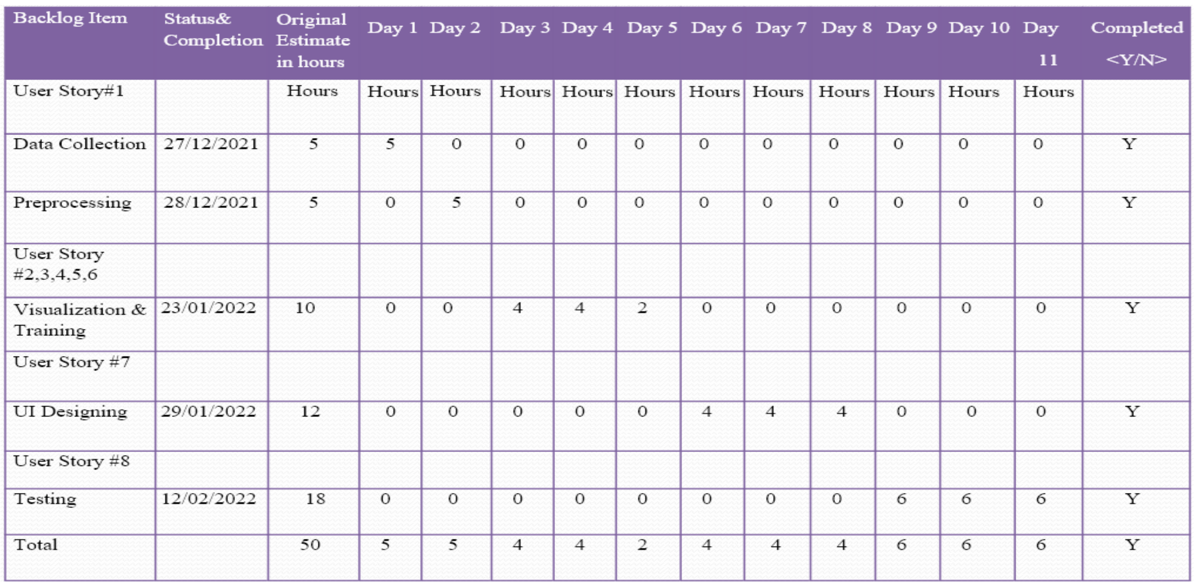
Backlog Item	Status& Completion	Original Estimate in hours	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10	Day 11	Completed <Y/N>
User Story#1		Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours	
Data Collection	27/12/2021	5	5	0	0	0	0	0	0	0	0	0	0	Y
Preprocessing	28/12/2021	5	0	5	0	0	0	0	0	0	0	0	0	Y
User Story #2,3,4,5,6														
Visualization & Training	23/01/2022	10	0	0	4	4	2	0	0	0	0	0	0	N
User Story #7														
UI Designing	29/01/2022	12	0	0	0	0	0	4	4	4	0	0	0	N
User Story #8														
Testing	12/02/2022	18	0	0	0	0	0	0	0	0	6	6	6	N
Total		50	5	5	4	4	2	4	4	4	6	6	6	N

Figure 3.10: Sprint1 Actual



Backlog Item	Status& Completion	Original Estimate in hours	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10	Day 11	Completed <Y/N>
User Story#1		Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours	
Data Collection	27/12/2021	5	5	0	0	0	0	0	0	0	0	0	0	Y
Preprocessing	28/12/2021	5	0	5	0	0	0	0	0	0	0	0	0	Y
User Story #2,3,4,5,6														
Visualization & Training	23/01/2022	10	0	0	4	4	2	0	0	0	0	0	0	Y
User Story #7														
UI Designing	29/01/2022	12	0	0	0	0	0	4	4	4	0	0	0	Y
User Story #8														
Testing	12/02/2022	18	0	0	0	0	0	0	0	0	6	6	6	N
Total		50	5	5	4	4	2	4	4	4	6	6	6	N

Figure 3.11: Sprint2 Actual



Backlog Item	Status& Completion	Original Estimate in hours	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10	Day 11	Completed <Y/N>
User Story#1		Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours	
Data Collection	27/12/2021	5	5	0	0	0	0	0	0	0	0	0	0	Y
Preprocessing	28/12/2021	5	0	5	0	0	0	0	0	0	0	0	0	Y
User Story #2,3,4,5,6														
Visualization & Training	23/01/2022	10	0	0	4	4	2	0	0	0	0	0	0	Y
User Story #7														
UI Designing	29/01/2022	12	0	0	0	0	0	4	4	4	0	0	0	Y
User Story #8														
Testing	12/02/2022	18	0	0	0	0	0	0	0	0	6	6	6	Y
Total		50	5	5	4	4	2	4	4	4	6	6	6	Y

Figure 3.12: Sprint3 Actual

Chapter 4

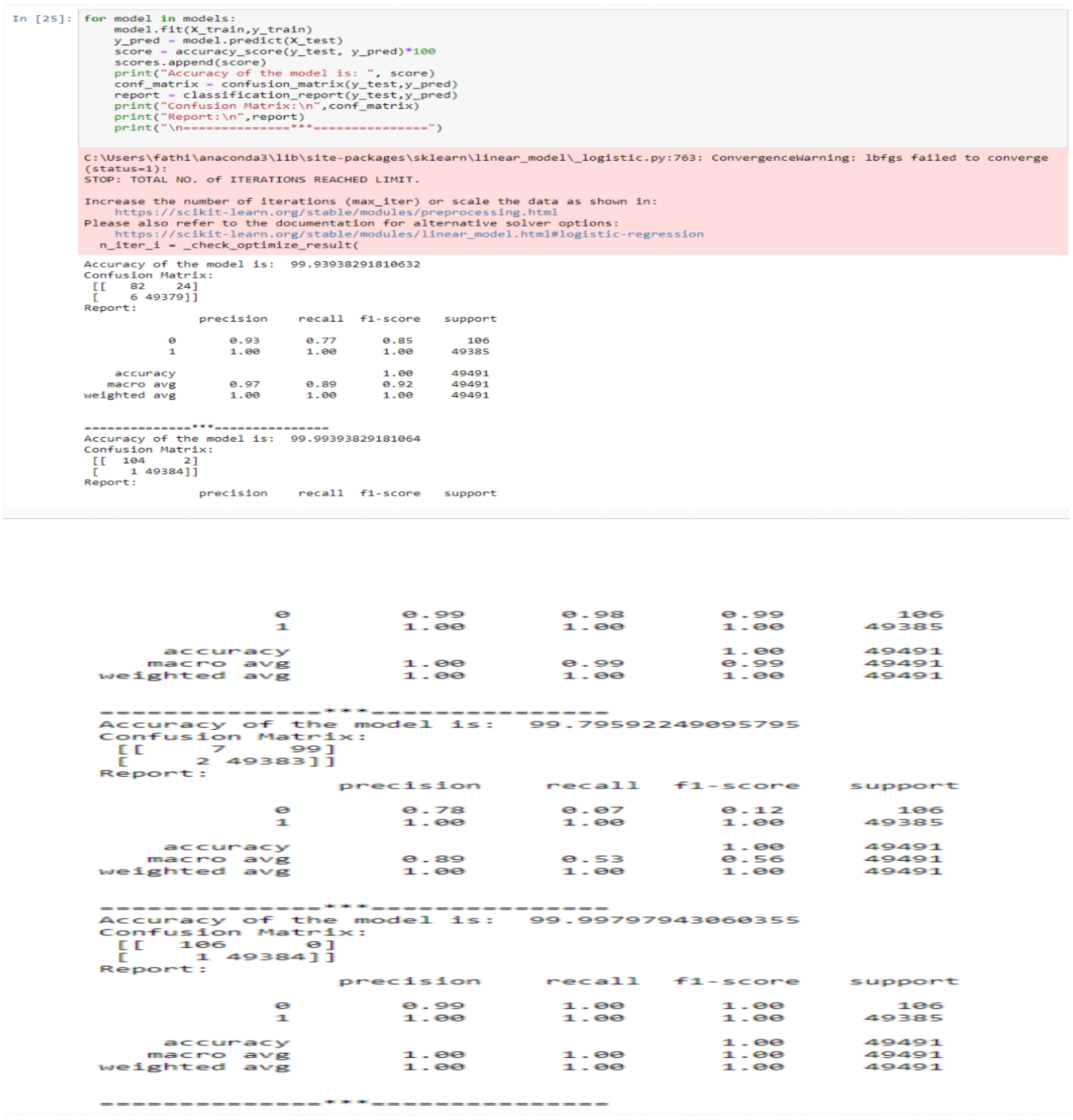
Results and Discussions

4.1 Datasets

In this project dataset used is DDoS attack dataset which is downloaded from kaggle website. DDoS attack dataset contains a lots of datas.Divide this dataset into training data and test data.We train and create a model using training data from the dataset and we test using test data to find the accuracy for the detection of DDoS attack.

4.2 Results

In this project,we use several machine learning algorithms to train a model which can be used to detect and classify the type of DDoS attack with greater accuracy.The above figures shows each model give better accuracy for the detection of DDoS attacks.The effect of Denial of Services will be detected by using this machine learning algorithms and the defect can be controlled by taking necessary precautions.

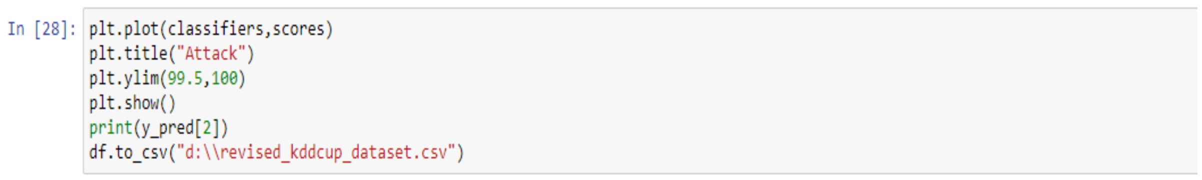


```
In [25]: for model in models:
             model.fit(X_train,y_train)
             y_pred = model.predict(X_test)
             score = accuracy_score(y_test, y_pred)*100
             scores.append(score)
             print("Accuracy of the model is: ", score)
             conf_matrix = confusion_matrix(y_test,y_pred)
             report = classification_report(y_test,y_pred)
             print("Confusion Matrix:\n",conf_matrix)
             print("Report:\n",report)
             print("\n==============***===============")
```

```
C:\Users\fathi\anaconda3\lib\site-packages\sklearn\linear_model\_logistic.py:763: ConvergenceWarning: lbfgs failed to converge
(status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
Please also refer to the documentation for alternative solver options:
    https://scikit-learn.org/stable/modules/linear_model.html#logistic-regression
  n_iter_i = _check_optimize_result(
Accuracy of the model is:  99.93938291810632
Confusion Matrix:
 [[   82    24]
 [    6 49379]]
Report:
               precision    recall  f1-score   support

           0       0.93      0.77      0.85       106
           1       1.00      1.00      1.00     49385

    accuracy                           1.00     49491
   macro avg       0.97      0.89      0.92     49491
weighted avg       1.00      1.00      1.00     49491


==============***===============
Accuracy of the model is:  99.99393829181064
Confusion Matrix:
 [[  104     2]
 [    1 49384]]
Report:
               precision    recall  f1-score   support
```

```
           0       0.99      0.98      0.99       106
           1       1.00      1.00      1.00     49385

    accuracy                           1.00     49491
   macro avg       1.00      0.99      0.99     49491
weighted avg       1.00      1.00      1.00     49491


==============***===============
Accuracy of the model is:  99.79592249095795
Confusion Matrix:
 [[    7    99]
 [    2 49383]]
Report:
               precision    recall  f1-score   support

           0       0.78      0.07      0.12       106
           1       1.00      1.00      1.00     49385

    accuracy                           1.00     49491
   macro avg       0.89      0.53      0.56     49491
weighted avg       1.00      1.00      1.00     49491


==============***===============
Accuracy of the model is:  99.99797943060355
Confusion Matrix:
 [[  106     0]
 [    1 49384]]
Report:
               precision    recall  f1-score   support

           0       0.99      1.00      1.00       106
           1       1.00      1.00      1.00     49385

    accuracy                           1.00     49491
   macro avg       1.00      1.00      1.00     49491
weighted avg       1.00      1.00      1.00     49491


==============***===============
```

Figure 4.1: Accuracy of the Detection



```
In [28]: plt.plot(classifiers,scores)
         plt.title("Attack")
         plt.ylim(99.5,100)
         plt.show()
         print(y_pred[2])
         df.to_csv("d:\\revised_kddcup_dataset.csv")
```

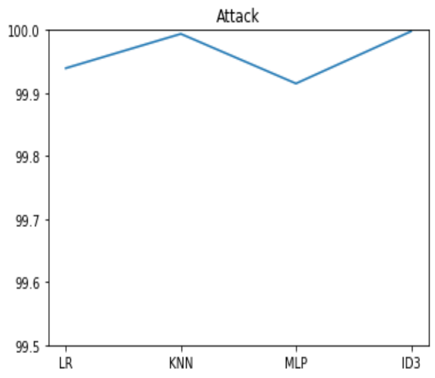


Figure 4.2: Graphical representation of the results

Chapter 5

Conclusions

A review has been made of the significant works in the fields of machine learning that are used to find the accuracy for the detection of DDoS attack. All these woks have emphasized distinct machine learning strategies utilized, informational index or datasets utilized, assessment measurements for every one of the systems utilized. To decide the powerful approach a few criteria must be considered. The criterion included classification time, training time, detection rate and accuracy. It is hard to distinguish a superior methodology of ML strategies dependent on just one factor like accuracy. On the off chance that the ML strategies looked at dependent on precision or accuracy.

References

[1] **William Stallings, “Cryptography and Network Security”, 5 th edition,Pearson Education.**

[2] **Simon Hansman. “A Taxonomy of Network and Computer Attack Methodologies” 2003.**

[3] **Abhishek Pharate , Harsha Bhat , Vaibhav Shilimkar “Classification of Intrusion Detection System” IJCS Volume 118 – No. 7, May 2015.**

[4] **T. Sree Kala, Dr .A. Christy “A Survey and Analysis of Machine Learning Algorithms for Intrusion Detection System” Jour of Adv Research in Dynamical and Control Systems, 04-Special Issue, June 2017.**

Appendix

Source Code

```
  #!pip install lib_ddos_simulator
import numpy as np
import seaborn as sns
import pandas as pd
import matplotlib.pyplot as plt
colnames =
     ["duration","protocol_type","service","flag","src_bytes","dst_bytes","land","wrong_fragment","urgent","hot","num_failed_logins","logged_i
len(colnames)
df =
     pd.read_csv("C:\\Users\\fathi\\Downloads\DDOS_Detection-master-20220205T052511Z-001\\DDOS_Detection-master\\dataset\\corrected.csv",heade
df.head(100)
df.shape
#extracting the icmp packets from our dataset
icmp_df = df[df.loc[:,"protocol_type"] == "icmp"]
#none of the values in dataset are null
icmp_df.isnull().sum()
icmp_df.head()
#I will be extracting all the important features as a "priori" for preprocessing
features = ["duration","service","src_bytes","wrong_fragment","count","urgent","num_compromised","srv_count"]
target = "result"
X = icmp_df.loc[:,features]
y = icmp_df.loc[:,target]
classes = np.unique(y)
print(classes)
#replacing all classes of attack with 1 and normal result with 0 in our icmp_df
for i in range(len(classes)):
   if i == 2:
      icmp_df = icmp_df.replace(classes[i], 0)
   else:
      icmp_df = icmp_df.replace(classes[i], 1)

#turning the service attribute to categorical values
icmp_df=icmp_df.replace("eco_i",-0.1)
icmp_df=icmp_df.replace("ecr_i",0.0)
icmp_df=icmp_df.replace("tim_i",0.1)
icmp_df=icmp_df.replace("urp_i",0.2)
y = icmp_df.loc[:,target]
#I selected certain features but I will have to find some covariance between them so I will plot a covariance heatmap
sns.heatmap(X.corr(), annot=True,cmap="RdBu")
plt.plot()
#the data as seen is highly uncorrelated as most of it is one valued such as the duration one.
X = icmp_df.loc[:,features]
y = icmp_df.loc[:,target]
X.head(100)
```

Appendix

```
print(list(X.loc[629,:])) #7 input features
from sklearn.model_selection import train_test_split
X_train, X_test, y_train, y_test = train_test_split(X, y, random_state=42, test_size=0.3)
from sklearn.linear_model import LogisticRegression
from sklearn.neighbors import KNeighborsClassifier
from sklearn.neural_network import MLPClassifier
from sklearn.tree import DecisionTreeClassifier

from sklearn.metrics import classification_report
from sklearn.metrics import confusion_matrix
from sklearn.metrics import accuracy_score
models = [LogisticRegression(), KNeighborsClassifier(n_neighbors=3),MLPClassifier(alpha=0.005),DecisionTreeClassifier()]
classifiers = ["LR", "KNN","MLP","ID3"]
scores = []
for model in models:
   model.fit(X_train,y_train)
   y_pred = model.predict(X_test)
   score = accuracy_score(y_test, y_pred)*100
   scores.append(score)
   print("Accuracy of the model is: ", score)
   conf_matrix = confusion_matrix(y_test,y_pred)
   report = classification_report(y_test,y_pred)
   print("Confusion Matrix:\n",conf_matrix)
   print("Report:\n",report)
   print("\n==============***===============")
   plt.plot(classifiers,scores)
plt.title("Attack")
plt.ylim(99.5,100)
plt.show()
print(y_pred[2])
df.to_csv("d:\\revised_kddcup_dataset.csv")
```